

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An apparatus comprising:

a fuel cell stack having a pair of electrodes including an anode and a cathode, and a thin film solid oxide electrolyte disposed therebetween; ~~wherein the electrolyte comprises a solid oxide; and~~

a manifold disposed on the fuel cell stack for conveying a fuel to the fuel cell stack;

a ~~catalytic microreactor~~ fuel processor, disposed on the manifold and having

~~(1) a manifold positioned in fluid communication with the fuel cell stack, the manifold for conveying a fuel to the anode and~~ a substrate support including at least one channel, and

—————(2) a catalyst for reforming the fuel; and

a combustor thermally coupled to the fuel processor.

2. (Currently amended) The apparatus of claim 1, wherein a distance between at least one of the ~~pair of electrodes~~ anode and the cathode and the catalyst is less than 10 millimeters.

3. (Currently amended) The apparatus of claim 2, wherein the distance ~~between at least one of the pair of electrodes and the catalyst~~ is less than 1 millimeter.

4. (Currently amended) The apparatus of claim 3 1, wherein the catalyst contacts at least one of the pair of electrodes.

5. (Currently amended) The apparatus of claim 4 1 herein the catalyst contacts the anode.

6. (Currently amended) The apparatus of claim 1, wherein the catalyst is disposed in at least a portion of the ~~manifold~~ substrate support.
7. (Currently Amended) The apparatus of claim 1, wherein the fuel cell stack, the manifold, and ~~and the catalytic microreactor~~ fuel processor together comprise a volume less than 1 liter.
8. (Original) The apparatus of claim 1, wherein the electrolyte has a thickness less than 10 micrometers.
9. (Original) The apparatus of claim 1, wherein the catalyst has a first temperature and the electrolyte has a second temperature during operation of the apparatus, and a difference between the first temperature and the second temperature is less than 200 degrees Celsius.
10. (Original) The apparatus of claim 9, wherein at least a portion of the manifold has a third temperature during operation, and a difference between the first temperature and the third temperature is less than 200 degrees Celsius and a difference between the second temperature and the third temperature is less than 200 degrees Celsius.
11. (Original) The apparatus of claim 1, wherein the manifold includes at least one wall comprising silicon.
12. (Original) The apparatus of claim 1, wherein the manifold comprises a flow passage having at least one dimension less than 5 millimeters.
13. (Previously Presented) The apparatus of claim 1, wherein a substrate defines the manifold.
14. (Withdrawn) An apparatus comprising: a fuel cell stack having a pair of electrodes including an anode and a cathode, and a thin film electrolyte disposed therebetween, wherein the electrolyte comprises a solid oxide; and a catalyst disposed proximate the

anode, the catalyst adapted to reform a fuel, wherein a distance between the anode and the catalyst is less than 1 millimeter.

15. (Withdrawn) The apparatus of claim 14, wherein the catalyst contacts the anode.

16. (Withdrawn) The apparatus of claim 14, wherein the catalyst is arranged to mix a fuel conveyed to the fuel stack through the catalyst in a first direction and at least one product emitted from the fuel stack through the catalyst in a second direction during operation of the apparatus.

17. (Withdrawn) The apparatus of claim 16, wherein the catalyst is adapted to accelerate a reaction between the conveyed fuel and emitted product.

18. (Withdrawn) The apparatus of claim 16, wherein the catalyst is adapted to react with the conveyed fuel to form an incoming fuel substantially free of at least one of water and oxygen.

19. (Withdrawn) The apparatus of claim 14, wherein the catalyst comprises a plurality of pores oriented substantially perpendicularly to the anode.

20. (Withdrawn) The apparatus of claim 14, further comprising: a manifold in fluid communication with the catalyst and adapted to deliver a fuel to the catalyst.

21. (Withdrawn) The apparatus of claim 20, wherein the manifold comprises at least one flow passage having at least one dimension less than 5 millimeters.

22. (Withdrawn) A method comprising: forming a fuel cell stack having a pair of electrodes including an anode and a cathode, and a thin film electrolyte disposed therebetween, wherein the electrolyte comprises a solid oxide; integrating a catalytic microreactor with said fuel cell stack, wherein said catalytic microreactor comprising (1) a manifold disposed in fluid communication with the fuel cell stack, the manifold adapted to convey a fuel to the anode and (2) a catalyst adapted to reform the fuel.

23. (Withdrawn) The method of claim 22, wherein forming the apparatus comprises at least one of photolithography and stamping.

24. (Withdrawn) The method of claim 22, wherein forming the apparatus comprises sputter deposition.

25. (Withdrawn) A method comprising: forming a fuel cell stack having a pair of electrodes including an anode and a cathode, and a thin film electrolyte disposed therebetween, wherein the electrolyte comprises a solid oxide; and forming a catalyst proximate the anode, the catalyst adapted to reform a fuel, wherein a distance between the anode and the catalyst is less than 1 millimeter.

26. (Withdrawn) The method of claim 25, wherein forming the fuel cell comprises at least one of photolithography and stamping.

27. (Withdrawn) The method of claim 25, wherein forming the fuel cell comprises at least one of sputter deposition and evaporative vacuum deposition.

28. (New) The apparatus of claim 1, wherein the fuel processor comprises the combustor with the catalyst disposed therein.

29. (New) The apparatus of claim 1, wherein the catalyst is disposed within the at least one channel.

30. (New) The apparatus of claim 1, wherein the catalyst comprises copper-samaria-ceria.

31. (New) The apparatus of claim 1, wherein the fuel processor further comprises a porous catalytic membrane disposed adjacent the manifold.

32. (New) The apparatus of claim 1, wherein the manifold comprises the support substrate integrated with the fuel processor.

33. (New) The apparatus of claim 1, wherein the combustor disposed on the fuel processor and provides sufficient heat for the catalyst to reform the fuel.
34. (New) The apparatus of claim 1, wherein during operation of the apparatus the combustor has a first temperature and the catalyst has a second temperature, and the combustor is thermally coupled to the fuel processor for the difference between the first temperature and the second temperature to be less than about 200 degrees Celsius.
35. (New) The apparatus of claim 1, wherein the combustor includes a catalyst material.
36. (New) The apparatus of claim 35, wherein the combustor includes at least one combustor channel and the catalyst material is positioned within the combustor channel.
37. (New) The apparatus of claim 1, wherein the combustor includes a channel for combining fuel and oxidant and generating heat.
38. (New) The apparatus of claim 1, wherein the combustor further comprises an electric heater.
39. (New) The apparatus of claim 1, wherein the manifold comprises an etched silicon-containing substrate.
40. (New) The apparatus of claim 1, wherein the substrate support is comprised of at least one of glass, ceramic, metal, or silicon.
41. (New) The apparatus of claim 1, wherein the at least one channel has a diameter of between about 100 micrometers and about 2 millimeters.
42. (New) The apparatus of claim 1, wherein the catalyst includes at least one of PtRu, CuO, Cu—ZnO, alumina, and Ni.